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STATE OF SOUTH DAKOTA

PUBLIC UTILITIES COMMISSION

IN THE MATTER OF THE PETITION OF WEST RIVER COOPERATIVE TELEPHONE COMPANY INC. FOR ARBITRATION PURSUANT TO THE TELECOMMUNICATIONS ACT OF 1996 TO RESOLVE ISSUES RELATED TO THE INTERCONNECTION AGREEMENT WITH ALLTEL, INC.	Docket No. TC07-116 **DIRECT TESTIMONY** **OF** **NATHAN A. WEBER**

DIRECT TESTIMONY OF NATHAN WEBER
ON BEHALF OF
WEST RIVER COOPERATIVE TELEPHONE COMPANY INC.

Q1. Please state your name, employer, business address and telephone number.

A1. My name is Nathan Weber. I am the Director of Engineering of Vantage Point Solutions, Inc. ("Vantage Point"). My business address is 2211 North Minnesota Street, Mitchell, South Dakota, 57301.

Q2. On whose behalf are you testifying?

A2. I am testifying on behalf of West River Cooperative Telephone Company Inc. ("West River"). Based on my experience working with West River for over 5 years, I know that West River provides local telephone exchange service and exchange access services in South Dakota and is engaged in the provision of general telecommunications services in the State of South Dakota subject to the jurisdiction of the South Dakota Public Utilities Commission ("Commission").

Q3. Generally, what types of services does Vantage Point perform?

A3. Vantage Point is a telecommunications engineering and consulting company whose services include long range communication plans and feasibility studies, emerging technology analysis and migration studies, telecommunications electronic equipment engineering, outside plant engineering, field services engineering and regulatory consulting.

Q4. What are your duties and responsibilities at Vantage Point?

A4. I am responsible for providing consulting and engineering services to clients in a wide array of technical and regulatory areas associated with telecommunications. Our client base consists of small Independent Telephone Companies such as West River. Vantage Point has more than 80 fulltime employees on staff. I am also responsible for the normal duties you would expect from the director of engineering for a company of our size.

Q5. What is your educational background?

A5. I have a Bachelor of Science in Electrical Engineering from South Dakota State University in Brookings, South Dakota.

Q6. Do you hold any professional engineering licenses?

A6. Yes. I am a licensed professional engineer in North Dakota and South Dakota. I am also a member of the National Council of Examiners for Engineering and Surveying (NCEES).

Q7. Do you have a resume of your experience?

A7. Yes, it is attached to my testimony as Exhibit NW-D-1.

Q8. What is the purpose of your direct testimony?

A8. The purpose of my direct testimony is to provide technical facts relating to the Arbitration[1] between West River and Alltel Communications, Inc. (Alltel). I will provide information relating to Issue 1 identified in the Petition for Arbitration for West River (referred to herein as the "Petition"). This issue was presented in the Petitions as follows: "Is the reciprocal compensation rate for IntraMTA Traffic proposed by Telco appropriate pursuant to 47 U.S.C. § 252(d)(2)?" Specifically, I will explain the engineering inputs and how they comply with FCC rule 51.505(b)(1).

Q9. Can you provide a general overview of the engineering inputs provided for the Forward-Looking Economic Cost (FLEC) model?

A9. The engineering inputs associated with the West River FLEC model consist of several components. First, the "Switching" network includes items associated with the deployment of a typical Class 4/5 voice switch. The individual components that were included in the FLEC engineering design for the switching network are separated into four main categories including Common, Line Cards, Line Interface Cards, and Trunk Cards. The "Inter-Exchange Transport" cost estimates associated with the West River FLEC study included Inter-Exchange Transport electronics and Outside Plant (OSP) cable to interconnect the respective exchanges. The Inter-Exchange Transport cost estimates were divided into three main categories including Base Costs, Line Costs, and Tributary Costs. Similarly,

[1] In The Matter of the Petition Of West River Cooperative Telephone Company Inc. for Arbitration Pursuant to the Telecommunications Act Of 1996 To Resolve Issues Related to The Interconnection Agreement With Alltel, Inc. (referred to herein as the "Petition").

the OSP cable construction cost estimates were separated into "Town" and "Rural" categories.

Q10. What voice switching technology and architecture was assumed in the development of the FLEC capital investment estimates?

A10. For the purposes of the FLEC engineering model for West River, it was assumed that they would deploy "Softswitching" technology within their network. The Softswitching technology is a packet, voice switching technology. This type of switch will allow for either Time Division Multiplexing (TDM) interfaces or packet interfaces to be deployed. The Softswitch uses packet technology for switching voice traffic, but this technology allows for either packet or TDM circuit connections to be used for line or trunk interfaces.

The Softswitch architecture, as commonly implemented in the industry and in the West River FLEC engineering model, consists of four components including the Call Agent, Signaling Gateway, Media Gateway, and Outboard Line Bays (OLB's). The function of a Call Agent is to provide services such as media and signaling gateway control and billing, call routing logic, Communications Assistance for Law Enforcement Act (CALEA) support, and miscellaneous subscriber services such as call waiting, distinctive ringing, and off-premise extensions. The Signaling Gateway's function is to provide the Signaling System 7 (SS7) signaling interface for the Softswitch. In addition, the Media Gateway provides media (voice) switching and processing capabilities. A diagram depicting this architecture is attached to my testimony as Exhibit NW-D-2.

The OLB equipment is used to provide analog plain old telephone service (POTS) line interfaces to the end subscribers. In a legacy digital switching architecture, the analog POTS lines were typically equipped in separate equipment bays, and the switch processors communicated with the analog POTS line cards via inter-bay interfaces and cables. One attribute of Softswitching platforms that is unique when compared to legacy digital switching architectures is the absence of on-board analog POTS line cards within the Media Gateway chassis. For Softswitch deployments, it is typically necessary to use devices such as OLB terminals, which are sometimes referred to as Digital Loop Carriers (DLC's), to provide analog POTS line card interfaces to serve the subscribers. For the West River FLEC engineering design, OLB's were assumed to provide this functionality. Like other Softswitching networks, the OLB's assumed in the West River FLEC engineering design function as virtual extensions of the Class 5 switch.

For West River, the FLEC engineering design assumed the use of a distributed Softswitching network. As part of this architecture, centralized Call Agents are assumed to be deployed at each "host" switching location. The locations that are designed to include the Call Agents for West River include Bison and Lemmon.

A single Media Gateway with a Signaling Gateway is included for each exchange. For new switching network deployments, this architecture is commonly deployed by telecommunications service providers whose number of subscribers and scope of services offered are comparable to West River.

The FLEC engineering design for West River also includes the deployment of "Intermediate Tandem" functionality at the Bison exchange. In this architecture, the trunks from the various West River exchanges are aggregated in the Bison switch. The purpose of this function is to provide improved efficiencies by maximizing the "fill" of the outgoing trunks to the Access Tandem provider. The assumed efficiency of the Intermediate Tandem function reduces the quantity of trunks to the Access Tandem provider by approximately 20 percent.

Q11. Can you explain the design parameters were considered when developing the switching network architecture for the FLEC model?

A11. The FLEC engineering design for West River was developed to provide an efficient voice switching network that offers the appropriate grade of service for the subscribers of West River. The ability to provide voice services with 99.999% availability is paramount to telecommunications service providers such as West River. One key attribute that is included in the design is emergency stand-alone capabilities for all exchanges. This emergency stand-alone functionality offers the ability for subscribers to make local calls in the event that the communication path to the Call Agent is severed.

In addition, the switching network is designed to adhere to the South Dakota service standards for telecommunications companies set forth in the Administrative Rules for South Dakota. Specifically, the switching system was assumed to include custom calling feature such as call waiting, call forwarding, abbreviated dialing, caller identification, and three-way calling as set forth in A.R.S.D. Section 20:10:33:04. Similarly, the switching network is designed to adhere to A.R.S.D. Section 20:10:33:05 which states that during any busy hour, the telecommunications service provider network must allow for a minimum of

98 percent of call attempts to receive dial tone within three (3) seconds, a minimum of 98 percent of properly dialed calls for extended service area to be properly terminated, and a minimum of 98 percent of properly dialed calls routed entirely over the network of the local exchange carrier to be properly terminated.

Other required functions included in the FLEC engineering design for the switching network include E-911 service support, as well as CALEA support. In addition, the switching network architecture for the West River FLEC engineering design included SS7 signaling capabilities.

Q12. In your expert opinion, is the technology and architecture used for the FLEC model considered to be an economical, long-term solution?

A12. Yes. As stated previously, the distributed Softswitching architecture assumed for the West River FLEC model is a commonly deployed model for new switching network implementations. One primary reason that this architecture is commonly deployed in this market space is due to the fact that it is a robust and cost-effective solution for telecommunications service providers.

Q13. With regards to the engineering design for the "Switching" network for West River, what components comprise the various categories (*e.g.* Common, Line Cards, Line Interface Cards, and Trunk Cards) for the FLEC capital investment estimates?

A13. The Switching network investments for West River are separated into four (4) primary categories including "Common", "Line Cards", "Line Interface Cards", and "Trunk Cards." First, the category of Common items includes components that are common to the system. This category of network investment does not include any voice circuit interface cards that are active in the proposed system. The items included in the "Common" investment category include, but are not limited to, the following: Call Agent hardware, Call Agent software, Media Gateway chassis (including redundant central processing units, power supplies, and cooling fans), Media Gateway software, Signaling Gateway hardware, EMS and Web Provisioning systems, feature right-to-use fees (e.g. CALEA, Centrex, Web Provisioning, Emergency Stand-Alone, and concurrent call license), Ethernet interface, OLB chassis, OLB processors, OLB administration interface, and spare circuit cards. A diagram depicting the allocation of the switching network components to the respective categories is attached to my testimony as Exhibit NW-D-3. In addition, a component level pricing breakdown for each category of investment at each respective exchange is attached to my testimony as Exhibit NW-D-4.

The "Line Cards" category includes only the analog POTS line cards that are equipped in the OLB chassis. No other equipment is included in this group.

Next, the "Line Interface Card" category includes equipment in the Media Gateway and OLB terminals. The items included are the circuit interface cards that provide DS-1 GR-303 connectivity between the Media Gateway and the OLB terminal.

Finally, the "Trunk Card" category includes circuit interface cards in the Media Gateway that are used for trunk interfaces. In other words, these circuit cards provide communication from the Media Gateway to the Public Switched Telephone Network (PSTN).

A loading factor is included to each investment category for the respective locations to account for miscellaneous items. Specifically, a 10 percent factor is incorporated in each category to account for installation materials and labor. In addition, a 15 percent factor is included for miscellaneous costs such as taxes and engineering.

Q14. What technology and configuration options were assumed for the Inter-Exchange Transport cost estimates?

A14. With regards to the FLEC engineering model designed for the West River Inter-Exchange Transport network, it is assumed that the network would be implemented as an OC-192 Synchronous Optical NETworking (SONET) transport network. In accordance with South Dakota Codified Law, Chapter 49-31-60, the transport network architecture was selected to provide highly available, switched, survivable optical transport rings between the respective exchanges. In order to accomplish this, the proposed network is designed in a ring architecture in which diverse fiber paths are utilized. This is a common network design architecture that limits the potential for an individual exchange from being isolated from the rest of the network due to a single fiber optic cable cut. SONET architectures typically offer rapid traffic recovery in the event of a fiber optic cable cut or optical transceiver failure. The target failure recovery time for SONET networks is approximately 50 milliseconds.

The proposed SONET infrastructure for West River is assumed to be a carrier-grade solution that includes redundant power supplies, processor units, switch fabric, timing units, and cooling fans. In addition, the system is designed to offer both Synchronous Transport Signal (STS) and Virtual Tributary (VT) switching capabilities to allow for granular traffic management capabilities. The solution included in the FLEC engineering design is required to support a variety of circuit interfaces such as OC-192, OC-48, OC-12, OC-3, DS-3, DS-1, Gigabit Ethernet, and 10/100 BaseT. With the exception of the Ethernet interface cards, the tributary interfaces are configured to provide hardware redundancy to ensure an appropriate level of availability. Traditional hardware redundancy is typically not available for Ethernet interfaces today.

Q15. How were the quantities of circuit interface cards assumed for the FLEC capital investment estimates derived?

A15. The quantities of circuit interface cards assumed in the FLEC engineering design are based upon the circuit requirements for the transport of the Switching network circuits, as well as miscellaneous special access circuits. The SONET solution assumed for this FLEC engineering design has circuit interface cards that have standard densities for interface port quantities. For example, the quantity of DS-1 ports provided on a single DS-1 interface card is 28. Similarly, the DS-3 circuit interface cards include eight DS-3 interfaces and the 10/100 BaseT Ethernet circuit interface cards include four 10/100 BaseT interfaces.

With regards to the SDN Terminal at the Bison exchange, it is assumed that the quantity of interfaces equipped at this location will match the equipment configuration that is presently deployed at this location.

Q16. With regards to the engineering design for the "Inter-Exchange Transport" network for West River, what components comprise the various categories (*e.g.* Base Cost, Line Interface, Tributary Interface, etc.) for the FLEC capital investment estimates?

A16. The "Inter-Exchange Transport" electronics assumed for the FLEC engineering design included items that are divided into three (3) primary categories including

"Base Cost", "Line Interface", and "Tributary Interface." The items included in the "Base Cost" category are essentially the common hardware and software elements that are required for the system. Specifically, these items include the equipment chassis, cooling fan modules, CPU, Digital Communications Channel (DCC) units, alarm interface units, timing and synchronization modules, STS switch fabric, VT1.5 switch fabric, system software, Element Management System software, and miscellaneous cabling. A diagram depicting this categorization of components is attached to my testimony as Exhibit NW-D-5. In addition, a component level pricing breakdown for each category of investment at each respective exchange is attached to my testimony as Exhibit NW-D-6.

The "Line Interface" cost category includes the OC-192 circuit interfaces cards that are necessary to provide the optical line interfaces between adjacent SONET network elements.

Finally, the "Tributary Interface" costs include a variety of circuit interface cards that are required to add and drop traffic at each respective location. These "Tributary Interface" cards assumed for West River include OC-48, DS-3, DS-1, Gigabit Ethernet, and 10/100 BaseT Ethernet circuit interface cards.

A loading factor is included to each investment category for the respective locations to account for miscellaneous items. Specifically, a 10 percent factor is incorporated in each category to account for installation materials and labor. In addition, a 15 percent factor is included for miscellaneous costs such as taxes and engineering.

Q17. What methodology was utilized to determine the total route mile distance for Outside Plant (OSP) fiber optic cable construction between the adjacent locations?

A17. In the development of the FLEC engineering design, it was assumed that the fiber optic transport infrastructure would be implemented to allow for diverse fiber routes to and from each respective exchange. This design methodology complies with South Dakota Codified Law, Chapter 49-31-60, by enabling switched survivable rings. In addition, diverse fiber optic cable routing is commonly implemented by companies such as West River to prevent a single fiber optic cable cut from isolating an exchange from the rest of the network. The design of the fiber optic cable route assumed cable placement that provides for the most probable and efficient route between adjacent exchanges. It is assumed that public right-of-way will be used for this fiber optic cable construction. Therefore, the assumed cable route was designed to follow existing roads. The approximate distance for the "Town" and "Rural" construction were summed to provide the total route mile distance between the respective exchanges. A diagram depicting the general fiber optic cable route is attached to my testimony as Exhibit NW-D-7.

Q18. What is considered "Town" construction versus "Rural" construction?

A18. For the purposes of this design, it was assumed that the fiber optic cable would be constructed to the existing central office building in each exchange. Any cable routes that fall within the city limits of a community, or within an area that has a population density consistent with a town environment, were designated as "Town" construction. The routes that fall outside the city limits (or comparable population density) are deemed to be "Rural" construction. A diagram depicting the separation of town and rural construction, as well as the general components included in each category, is attached to my testimony as Exhibit NW-D-8.

Q19. How was the per-foot rate for the OSP "Town" construction estimates determined?

A19. The OSP "Town" construction per-foot costs were developed by analyzing deployment costs for actual "Town" construction for communities in South Dakota. The costs used to develop the per-foot rate were based upon actual OSP costs for Fiber to the Premises (FTTP) projects in four communities. The communities whose FTTP construction pricing data was utilized include Brandon, Garretson, Site C (South Dakota Company that is not part of this litigation), and Mitchell.

The unit tabulations from the construction for these communities were reviewed, and any units associated with a subscriber drop (connection to a subscriber location) were removed from the calculation. This was done so that only "main-line" cable construction was included in the estimates. The subscriber drop construction costs were removed from the per-foot calculation due to the fact that it is not representative of the OSP town construction required for Inter-Exchange transport.

The total footage for the four communities was summed, along with the total construction cost for the fiber optic cable construction in these communities. The sum of the total construction in these four communities is 1,525,730 feet of construction at a price of $18,203,871.57. The resulting total cost was divided by the total footage to determine the average cost per foot. The outcome was a total cost per foot estimate of $11.93. A loading factor of 15% for engineering and taxes was added to determine the final result of $13.72 per foot for OSP town construction. A detailed pricing breakdown showing the unit quantities and unit costs used to derive the per-foot pricing estimate for town construction is attached to my testimony as Exhibit NW-D-9.

Q20. How was the per-mile rate for the OSP "Rural" construction estimates determined?

A20. The OSP Rural construction estimates for West River were based upon actual rural fiber optic cable construction costs within their service territories. The pricing of $962,406.43 is the construction cost for a 118 mile OSP project that was bid for West River in July 2006. An annual "normalization" factor of 5% was added to the OSP bid price to determine the estimated current pricing for rural construction. The result of this normalization is an estimated cost for construction of $1,010,526.75 for an equivalent project being bid in December 2007. Dividing this normalized total by 118 routes miles provides an average cost per mile of approximately $8,560 in the West River service territories. This result was subsequently multiplied by a 15% loading factor to account for items such as engineering and taxes. The final, loaded cost per mile for rural OSP construction is estimated at approximately $9,844. A detailed pricing breakdown showing the unit quantities and unit costs used to derive the per-foot pricing estimate for town construction is attached to my testimony as Exhibit NW-D-10.

Q21. Does that conclude your testimony?

A21. Yes. However, I wish to reserve the opportunity to supplement this testimony in the future, if necessary.

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IN THE MATTER OF THE PETITIONS FOR ARBITRATION PURSUANT TO THE TELECOMMUNICATIONS ACT OF 1996 TO RESOLVE ISSUES RELATED TO THE INTERCONNECTION AGREEMENT WITH ALLTEL, INC.	Docket No. TC07-111 Through TC07-116 **REBUTTAL TESTIMONY** **OF** **NATHAN A. WEBER**

REBUTTAL TESTIMONY OF NATHAN A. WEBER ON BEHALF OF ALLIANCE COMMUNICATIONS COOPERATIVE, INC., MCCOOK COOPERATIVE TELEPHONE COMPANY, BERESFORD MUNICIPAL TELEPHONE COMPANY, KENNEBEC TELEPHONE COMPANY, INC., SANTEL COMMUNICATIONS COOPERATIVE, INC., AND WEST RIVER COOPERATIVE TELEPHONE COMPANY INC.

Q1. Please state your name, employer, business address and telephone number.

A1. My name is Nathan Weber. I am the Director of Engineering of Vantage Point Solutions, Inc. ("Vantage Point"). My business address is 2211 North Minnesota Street, Mitchell, South Dakota, 57301.

Q2. On whose behalf are you testifying?

A2. I am testifying on behalf of Alliance Communications Cooperative, Inc. ("Alliance"), McCook Cooperative Telephone Company ("McCook"), Beresford Municipal Telephone Company ("Beresford"), Kennebec Telephone Company

("Kennebec"), Santel Communications Cooperative, Inc. ("Santel"), and West River Cooperative Telephone Company Inc. ("West River"). I will refer to them collectively as the Rural Telephone Companies (RTC's).

Q3. Have you previously filed testimony in this case?

A3. Yes. On March 24, 2008, I filed direct testimony on behalf of each of the six companies (Alliance, McCook, Beresford, Kennebec, Santel, and West River) in dockets TC07-111 through TC07-116.

Q4. What is the purpose of your rebuttal testimony?

A4. To respond to technical and regulatory issues that rose in the direct testimony and supplemental direct testimony of W. Craig Conwell on behalf of Alltel Communications, LLC. ("Alltel") in these proceedings.

Q5. Have you read the pre-filed direct testimony and supplemental direct testimony of Mr. Conwell in these proceedings?

A5. Yes.

Q6. Mr. Conwell states, "[RLECs] have failed to produce documentation that would satisfy the requirements of FCC Rule §51.505(e)". He lists the example of the cost studies assuming similar configurations of equipment for switches and transport electronics (between host and "non-host switches") and not showing the alternative, lower cost configurations that might be used and therefore have not proven that the "efficient network configuration" requirement of §51.505(b)(1) has been met[1]." Do you agree with Mr. Conwell's statement? Please explain.

[1] Mr. Conwell's Supplemental Direct Testimony, Page 5 Lines 1-17.

A6. No. The switching and transport networks assumed for the FLEC engineering model utilized commonly deployed network architectures for the respective companies and networks. In addition, the proposed network plan is a forward looking architecture that is intended to be adequate for the typical life cycle of the transport and switching electronics. Specifically, it is my experience that transport electronics have a useful life of 7 to 10 years, while switching electronics are typically utilized for 10 to 12 years. Future network replacements or additions prior to the end of the useful life of the equipment caused by under-engineering the system actually cause the solution to be less efficient. Ultimately, the network replacements or enhancements required prior to the end of the useful life of the electronics have the effect of increasing the total long-run cost of the network.

As will be subsequently stated in my rebuttal testimony, multiple options were considered for the switching network configuration. Ultimately, these options were evaluated and the most efficient solution was utilized for the FLEC engineering model.

Q7. Mr. Conwell states, "Nor is there any evidence that the RLEC proposed packet switching network represents a more efficient configuration."[2] Do you agree with this statement? Please explain.

A7. Absolutely not. Mr. Conwell seems to imply in his statement that legacy digital electronic switching platforms such as the Nortel Networks Inc. ("Nortel") DMS-10 may represent a more efficient switching configuration than the packet

[2] Mr. Conwell's Direct Testimony, Page 21 Lines 2-3.

switching architecture that was utilized in the development of the FLEC model. There are several reasons why the new "Next Generation" packet-based switching platforms are more efficient than legacy digital electronic switching systems. First and foremost, the typical status of the legacy digital electronic switching systems that are marketed to RTC's is that these products have either been "capped" or Manufacture Discontinued (MD'd). For example, the Nortel DMS-10 switching architecture has been capped. In other words, Nortel is no longer developing new hardware or software features for this system. In addition, Nortel has announced the MD of all of their DMS remote switches with the exception of the RLCM. Other companies who market Class 5 switches to RTC's such as the Siemens EWSD and the Stromberg-Carlson (now owned by GenBand) DCO have also announced the MD of all or portions of the respective platforms. This distinct trend in the industry shows that legacy digital electronic switching systems are at the end of their lifecycle. It would be extremely inefficient to implement a switching network architecture today and then have to make a significant investment in a replacement switch within a matter of only a few years.

Secondly, legacy digital switches typically have separate equipment bays, shelves, and/or circuit cards for each service type (e.g. toll trunks, GR-303, ISDN, etc.) With the advent of packet switching technologies, multiple services types are supported on a single circuit interface card. In many cases, the packet switching systems can offer toll, GR-303, and ISDN on the same card, and the network operator can software-select the service type on a port-by-port basis.

Because of this fact, the investment required for a packet switching platform is often less than a legacy platform by having fewer components to purchase and spare.

Q8. Mr. Conwell states, "in the cases of Santel and West River, Alltel meet points with Qwest, which I understand is the transit provider for mobile–to-land traffic, are at switches other than Woonsocket and Bison. This means that the incremental tandem switch investments for these RLECs are likely not direct costs of termination. If so, the tandem switch portion of the investments should be removed."[3] Do you agree with this statement? Please explain.

A8. I do not agree with Mr. Conwell's assessment of the tandem switching functionality. The purpose of providing the intermediate tandem switching capabilities for the respective sites such as Brandon, Woonsocket, and Bison is to provide improved efficiencies for the network. Specifically, the intermediate tandem function provides economies of scale to allow for better fill (utilization) of outgoing trunks to other connecting carriers, and this functionality is assumed to provide a 20 percent reduction in the quantity of trunks that are required to be interfaced to other carriers. It can therefore be concluded that the intermediate tandem functionality provides approximately a 20 percent reduction in the cost for the RTC's to transport the traffic to their access tandem provider and other interconnected carriers.

[3] Mr. Conwell's Direct Testimony, Page 27 Lines 16-21.

Mr. Conwell implies in his testimony that the cost associated with the tandem switching functionality for these switches may be greater than other hosts of comparable size. This is an inaccurate statement. The cost for providing the intermediate tandem switching functionality for these sites is extremely low. In fact, the Woonsocket intermediate tandem switch has the highest incremental cost on a percentage basis for providing this functionality. The total incremental cost for the intermediate tandem function is approximately 0.87 percent of the total estimated switch investment for Santel.

Mr. Conwell also made incorrect statements regarding the meet point locations with Santel and West River. In his testimony, Mr. Conwell indicated that "...in the cases of Santel and West River, Alltel meet points with Qwest, which I understand is the transit provider for mobile-to-land traffic, are at switches other than Woonsocket and Bison." First, I assume that Mr. Conwell was referring to the RTC meet point with Qwest, and not the Alltel meet point. The portion in which Mr. Conwell states that the meet points with Qwest are at "switches" other than Woonsocket and Bison is technically incorrect. Qwest has transport facility meet points with Santel at Mitchell and with West River at Maurine. However, there is no RTC switch at either of these locations. In fact, both Mitchell and Maurine are outside the RTC service territories for Santel and West River respectively.

Q9. Please address Mr. Conwell's statement that, "Kennebec should show that there are no technically feasible alternatives but to spend $346,200 for common equipment, line interfaces and line cards for a switch with 334 lines in service."[4]

A9. During the course of developing the Kennebec switching architecture estimates, several architectural options were examined. One of the requirements set forth for each option was that it needed to provide a sufficient Grade of Service (GoS), including Emergency Stand-Alone (ESA) functionality for each site. The specific options that were examined include the following:

- MetaSwitch Distributed Media Gateway
- MetaSwitch Integrated Softswitch
- Nortel CS-1500

These options represent the most commonly deployed switches in the RTC market today. Rather than inappropriately focusing on one specific exchange, we evaluated the total cost for the proposed switching network for Kennebec Telephone Company. The results showed that the MetaSwitch Distributed Media Gateway option that was included in the FLEC engineering model was the lowest cost solution. The MetaSwitch Integrated Softswitch was approximately 6 percent more expensive than the MetaSwitch Distributed Media Gateway option that was used in the FLEC study, while the Nortel CS-1500 option was more than 30 percent more expensive. Therefore, it was concluded that the MetaSwitch

[4] Mr. Conwell's Direct Testimony, Page 29 Lines 8-11.

Distributed Media Gateway option that was included in the FLEC engineering model is an efficient solution.

Q10. Can you please answer Mr. Conwell's question of "Are all components of switch investment indeed for switching equipment, as opposed to DLC systems, interoffice transport systems or other?"[5]

A10. Yes. In answer to Mr. Conwell's question, all components of the switch investment are for equipment that is consistent with the switching function. No investments have been included that are associated with interoffice transport functions. Outboard Line Bays (OLB's) were included in the switching network investment estimates due to the fact that they function as virtual extensions of the switch.

Q11. Can you please answer Mr. Conwell's question of "Do switch investments include investment for tandem switching?"[6]

A11. Yes. As stated previously, there are investments included in the switching network cost estimates for the intermediate tandem switching functionality at the locations such as Brandon, Woonsocket, and Bison. The cost to provide this functionality is very minimal and is more than offset by the network efficiencies achieved.

[5] Mr. Conwell's Direct Testimony, Page 30 Lines 7-8.

[6] Mr. Conwell's Direct Testimony, Page 30 Line 12.

Q12. Can you please answer Mr. Conwell's question of "Are the quantities of equipment items included in switch investments sized as efficiently as possible based on expected demand and the capabilities of equipment?"[7]

A12. Yes. In answer to Mr. Conwell's question, the quantities of equipment items included in the switch investments are sized as efficiently as possible. As with many other technologies, the manufacturers of switching electronics components have determined that it is more economical for them to develop and manufacture components that accommodate a wide range of companies and exchanges. This is common practice due to the fact that economic analyses have shown it is less expensive for the switch vendor to design, manufacture, stock, and support fewer items. The system was designed to be efficient based on the equipment presently available from commonly deployed switching vendors that serve the RTC marketplace.

Q13. Can you please answer Mr. Conwell's question of "Are equipment unit costs or material prices from valid sources and representative of the current costs to purchase and install switching equipment?"[8]

A13. Yes. In answer to Mr. Conwell's question, the equipment costs utilized for the FLEC model are based upon a composite of proposals received from switching electronics vendors for entities other than Allliance, Beresford, Kennebec, McCook, Santel, and West River. The pricing utilized is specific to projects of

[7] Mr. Conwell's Direct Testimony, Page 30 Lines 17-19.

[8] Mr. Conwell's Direct Testimony, Page 30 Lines 20-22.

similar size and scope to the respective RTC networks. For all companies, the pricing was based on a commonly deployed switching platform and configuration.

Q14. Can you please answer Mr. Conwell's question of "Are there alternative technologies or network configurations that would be more efficient, particularly for small host and "non-host switches?"[9]

A14. Yes. During the process of developing the FLEC engineering model, we examined several potential architectures for the switching networks. Each of the solutions evaluated were able to provide the requisite GoS that were included in the design requirements. As with Kennebec, the results of the evaluation consistently showed that the MetaSwitch Distributed Media Gateway architecture was an efficient solution for the respective companies.

Q15. Can you please answer Mr. Conwell's question of "are the 'non-host switches' actually switches according to the FCC definition of termination, as opposed to DLC terminals, remote loop concentrators, etc.?"[10]

A15. Yes. The "non-host" switches are actually switches and not DLC terminals. The architecture utilized for the FLEC engineering model was a packet switching model with Media Gateways at all exchanges and centralized Call Agents. The Media Gateways have ESA functionality, as well as trunking capabilities.

[9] Mr. Conwell's Direct Testimony, Page 31 Lines 1-2.

[10] Mr. Conwell's Direct Testimony, Page 31 Lines 3-5.

Q16. Mr. Conwell states, "RLECs had not produced information giving details on the equipment items, capacities, quantities and unit investments underlying the total investments for each exchange and category. Therefore, it was not possible to fully evaluate the investments for compliance with FCC Rule §51.505(b and §51.505(b)(1) (the definition of TELRIC and the efficient network configuration requirement)[11]." Do you agree with Mr. Conwell's statement? Please explain.

A16. No, I do not agree with Mr. Conwell. Sufficient information was provided with the supplemental discovery response to show the software components and equipment quantities that were included in the switching network cost estimates for each exchange. The RTC's have provided a detailed equipment list that provides a description of each component, a quantity of each component, and a categorical total for the base cost, trunk interface, line interface, and line cards. This level of information provides more than adequate detail to enable Alltel to test the design.

[11] Mr. Conwell's Supplemental Direct Testimony, Page 6 Lines 10-15.

Q17. Mr. Conwell states in regard to the spreadsheet labeled "CO Switch Detailed Estimates" provided by the RLECS that, "The spreadsheet identifies hardware and software components included and the quantities of each. But, it does not provide component capacities (if applicable) and unit investments."[12] Do you agree with Mr. Conwell's statement? Please explain.

A17. Mr. Conwell's statement regarding the component capacities not being provided is inaccurate. The descriptions for each circuit interface card provide very specific information regarding the quantity of interface ports on each circuit card. In addition, details were provided to Alltel in the initial discovery responses regarding the maximum number of concurrent calls that could be provided from a "host" or "non-host" location. The combination of this information sufficiently provides the component capacities of the proposed packet switching systems.

Q18. Mr. Conwell states that "The RLECs continue to not provide specific details regarding the sources of the unit investments." And adds that "RLECs have failed thus far to prove that the unit investments underlying total switch investments in their cost studies are representative of the current costs the RLECs would incur to purchase and install new switches."[13] Do you agree with Mr. Conwell's statement? Please explain.

A18. No, I do not agree with Mr. Conwell. A significant amount of information has been provided to Alltel with regards to the switching network investment detail. Alltel has received detailed descriptions of the individual components that

[12] Mr. Conwell's Supplemental Direct Testimony, Page 7 Lines 15-17.

[13] Mr. Conwell's Supplemental Direct Testimony, Page 8 Lines 9-10 and Lines 22-25.

comprise the estimates, as well as quantities of these components. This amount of information is adequate to allow Alltel to test the design and cost estimates for the proposed system.

Q19. Do you agree with Mr. Conwell when he states "MetaSwitch also offers an 'integrated softswitch option' that might satisfy RLEC requirements and provide a more "efficient network configuration" per §51.505(b)(1)"[14]? Please explain.

A19. No, I do not agree with Mr. Conwell. To clarify, MetaSwitch does offer an integrated softswitch option in which the Call Agent functionality is implemented in each switch (Media Gateway) rather than being centralized. However, when we examined this alternative configuration, it was determined that the integrated softswitch option was more expensive and less efficient than the distributed media gateway architecture that was utilized. This cost increase is caused by several factors. First, investment in Call Agent functionality is required at all locations for the integrated softswitch option rather than at select, centralized locations. In addition, the integrated softswitch option may require additional investment in Element Management System hardware and software. This is due to the fact that call agents must be provisioned and managed at every location rather than at centralized locations. In fact, we found that the integrated softswitch option would be approximately 22.3 percent more expensive than the distributed media gateway architecture for Santel and 18.9 percent more expensive for West River.

[14] Mr. Conwell's Supplemental Direct Testimony, Page 9 Lines 21-22 and Page 10 Line 1.

Q20. Do you agree with Mr. Conwell's statement where he indicated "A pair of CAs is deployed in each exchange, or at each host and 'non host switch'" [15].

A20. No, Mr. Conwell is mistaken. As stated in my direct testimony, the FLEC engineering design assumed the use of a distributed softswitch architecture. In other words, Media Gateways were equipped in each exchange, but the Call Agents that facilitate the call contract were centralized in one or two sites per company. Specifically, the Call Agents were only equipped at the "host" switching locations. The distributed softswitch architecture was chosen to reduce cost and increase the efficiency of the network. The integrated softswitch architecture that Mr. Conwell suggested may be more efficient requires Call Agent functionality to be equipped at all exchanges. As stated previously, the integrated softswitch architecture is more expensive, and less efficient from a network management perspective, than the distributed softswitch architecture that was assumed for the FLEC engineering model.

Q21. Do you agree with Mr. Conwell when he states "it appears that little, if any, of the investment and associated annual costs included in the switch *common* category are usage-sensitive or attributable to terminating mobile-to-land traffic"[16]? Please explain.

A21. No, I do not agree with Mr. Conwell. Telephone switch engineering technical documents often make reference to traffic sensitive design and engineering. In fact, Mr. Conwell referred to some of the traffic sensitive design parameters in his

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[15] Mr. Conwell's Supplemental Direct Testimony, Page 9 Lines 13-15.

[16] Mr. Conwell's Supplemental Direct Testimony, Page 12 Lines 13-15.

direct testimony when he referred to the Busy Hour Call Attempt (BHCA) values that were provided on the MetaSwitch website. With telephone switching systems, multiple portions of the system, including the switching fabric, are engineered to a particular GoS. The traffic sensitive components are typically engineered and provisioned based on a particular GoS expressed in either Erlangs or Centum Call Seconds ("CCS").

Q22. Are there portions of the switching network that are not traffic sensitive?

A22. Yes. The non-traffic sensitive portions of a wireline switching network are the physical subscriber line termination interface (Line Card) and the physical subscriber local loop (typically copper cable) that connects the physical line termination to the subscriber. The physical trunk termination interface (often referred to as a Trunk Card) is traffic sensitive since the quantity of the physical trunk interfaces required is driven by the traffic in the system. Let me discuss each of these elements in detail.

The physical subscriber line termination is often referred to as a "line card" in the switching jargon. This physical line termination has a one-to-one relationship with the quantity of lines in the serving area. Simply put, for every subscriber line in the serving area, the RTC must provide one line card termination. No traffic engineering is required for the line card.

The physical subscriber local loop is defined as the physical facility that connects the subscriber premise to the Line Card Termination. This connection can be either fiber or copper (depending upon the design of the network distribution architecture). Regardless of the facility used, the "local loop" is designed the same whether the subscriber uses the facility for one minute a day or 1,440 minutes (24 hours) a day. Clearly, the physical subscriber local loop that connects the subscriber premise to the Line Card is not traffic sensitive.

Q23. Is everything in the switch traffic engineered, and thus traffic sensitive, except for the line card?

A23. Yes. However, with the advances in processing technology, the switching manufacturers have pre-engineered some of the switching components to accommodate a wide range of traffic levels. As stated previously, financial analysis has shown that it is typically less expensive for switching vendor to design, manufacture, stock, and support fewer items. One of the most prominent pre-traffic engineered components is the switching processor. Most switching manufacturers offer very little choice in the selection of processor capacities. It is a business decision for the switching vendors to select a processor design that will cover the target traffic levels of their market. In fact, over the life of a particular switching product line, the industry changes and growth in traffic has necessitated processor upgrades to accommodate the added switching requirements. I do not draw a distinction between items that are traffic engineered by the switching manufacturer during the design phase and items that are traffic engineered during the procurement phase. The final conclusion is that all of the components with the exception of the Line Card in a switching system are traffic engineered and are traffic sensitive.

Q24. Do you agree with Mr. Conwell in regards to Call Agent when he states "CA investments and costs are not usage-sensitive and recoverable in termination charges"[17]? Please explain.

A24. Absolutely not. In Mr. Conwell's testimony, he specifically references the MetaSwitch website and indicates that the CA9024 Call Agent Server has design parameters that include the quantity of Busy Hour Call Attempts (BHCA). This parameter which specifically addresses the limit with regards to the number of call attempts that can be successfully handled by the Call Agent over a given period of this is, by nature, a usage sensitive parameter. In addition, MetaSwitch charges Concurrent Call Licenses for the Call Agents. This fact indicates that the Call Agent is usage sensitive, and the costs increase incrementally with increased usage of the component.

Mr. Conwell's argument centers on the assertion that since the RTC's usage will not exhaust the capacity of the Call Agent, the Call Agent is not usage sensitive. Essentially, Mr. Conwell is implying that <u>if</u> there were two Call Agent options available that each have respective limitations for traffic sensitive parameters such as BHCA, the only Call Agent that can be classified as traffic sensitive is the one than may be exhausted by potential use of the component. This argument is extremely flawed. It would be analogous to stating that a four-lane portion of Interstate 90 through Sioux Falls is traffic sensitive due to the fact that there is sufficient population to exhaust the capacity, but the four-lane portion of Interstate 90 that passed by Kennebec is not traffic sensitive.

[17] Mr. Conwell's Supplemental Direct Testimony, Page 9 Lines 20-21.

MetaSwitch makes a single external Call Agent that is sized for a wide variety of companies and application because they have determined it to be more economical to develop, manufacture, stock, and support a single device. Therefore, the smallest, and most economical, Call Agent from MetaSwitch was utilized in this design.

Q25. Do you agree with Mr. Conwell in regards to 3510 Media Gateway (MG) Chassis and MG software when he states "their investments and costs are not usage-sensitive and recoverable in termination charges. This also applies to the associated MG software"[18]? Please explain.

A25. No. As stated previously, switching manufacturers typically pre-engineer the switching components to accommodate a wide range of traffic levels. However, the components of the switching network, with the exception of the line cards, are traffic engineered and are traffic sensitive. With regards to the Media Gateway, it does not contain line cards; therefore, it can be concluded that all components of the Media Gateway are traffic sensitive. Once again, Mr. Conwell's assertion that the Media Gateway is not traffic sensitive because the RTC's traffic will not exhaust the capabilities is fundamentally flawed.

[18] Mr. Conwell's Supplemental Direct Testimony, Page 10 Lines 13-15.

Q26. Do you agree with Mr. Conwell in regards to Outboard Line Bay when he states "OLB chassis and processor appear to be terminals for broadband loop carriers, similar to digital loop carrier systems. They are part of access or loop plant and should be excluded from termination, just as a digital loop carrier system would not be included in termination provided in a traditional TDM switch architecture"[19]? Please explain.

A26. No. As stated in my direct testimony, the switching architecture included investments for Outboard Line Bay (OLB) terminals. The OLB's serve as virtual extensions of the switching platform by providing plain old telephone service (POTS) interfaces for customers. In addition, the FLEC engineering model assumed that the OLB's would connect to the packet switching platform via GR303 based DS-1 connections. These connections are traffic engineering based on the desired concentration ratio and GoS offered to subscribers. The FLEC model assumed a concentration ratio of 4:1 for the ratio of analog POTS interfaces to DS-0 equivalents for the GR-303 DS-1 interfaces. This is a typical concentration ratio for an RTC with mostly residential subscribers. This ratio can chance based on the changing mix of traffic over time. For example, if factors such as additional call volumes or longer hold times occur, it may be necessary to reduce the concentration ratio to 2:1. This would require additional GR303 based DS-1's to be equipped in both the packet switch and the OLB. Therefore, the OLB equipment, with the exception of the analog line cards, can be considered traffic sensitive and is appropriate to categorize with the switching electronics.

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[19] Mr. Conwell's Supplemental Direct Testimony, Page 11 Lines 21-24 and Page 12 Lines 1-2.

Q27. Do you agree with Mr. Conwell when he states "Since the RLECs have not produced unit investments for each component, it is not possible to determine the significance of spare costs. Nevertheless, given that many switches likely are in unmanned locations requiring a technician to be dispatched for physical repairs, a more efficient network configuration might result from centralizing spares and reducing their quantity and costs"[20]? Please explain.

A27. I do not agree with Mr. Conwell. The RTC's have provided sufficient data for Alltel to test the design and cost estimates provided with the FLEC engineering model. As part of this, the level of detail provided to Alltel is sufficient for them to make a determination as to the approximate cost of spares, as well as the relative cost in relation to the entire switching network. Regardless, the packet switching network architecture assumed for the FLEC model has more efficient sparing arrangements than legacy digital switching architectures. The legacy architectures, by nature, have a wide variety of circuit interface cards that need to be spared, enough to literally fill one or more storage cabinets. In comparison, the packet switching architectures require very few spares, and the cost of these spares is smaller, as well.

It is the goal of our clients to expedite the correction of any service affecting event on the network. In many cases, the RTC's serve very large geographical territories. In the case of West River, the driving distance between Bison and Nisland is over 100 miles. If an outage occurred in this network due to a failed circuit card, it may take up to two hours to retrieve a spare from Bison,

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[20] Mr. Conwell's Supplemental Direct Testimony, Page 12 Lines 5-10.

drive the equipment to Nisland, and replace the failed circuit card. The duration of service outage induced by centralizing spares does not adhere to the GoS required of these RTC's.

Service providers that cover large geographic territories often will utilize "area" technicians to serve their subscribers better. These are technicians who are located in or near the outlying exchanges. If spares are distributed to each exchange, the service outage time due to hardware issues can be greatly reduced. This is especially true for larger, less populated service territories.

Q28. Do you agree with Mr. Conwell when he states "one factor contributing to high investments per line for small exchanges is that media gateways and related components are assumed to be placed in all exchanges regardless of line size"[21]? Please explain.

A28. I agree with the statement that Media Gateways and the associated components were assumed for each exchange. This is necessary in the packet switching architecture for providing the appropriate GoS for the RTC's. Specifically, the target that these networks were designed to achieve is 99.999% availability. The Media Gateways allow for functionality such as ESA in each exchange. This is considered a critical requirement that allows the consumers to make local calls, including local emergency calls, in the event that the communication path to the Call Agent is severed.

However, it should be noted that this packet switching design with centralized Call Agents and distributed Media Gateways is an efficient

[21] Mr. Conwell's Supplemental Direct Testimony, Page 13 Lines 7-10.

architecture for the RTC's. This is a commonly deployed architecture for many rural service providers due to the fact that the design is very efficient. The primary cause for the "high investment per line" that Mr. Conwell references is the fact that these RTC's serve rural areas. They do not have the subscriber base that provides the economies of scale that can be achieved in major metropolitan markets such as Seattle, Washington.

Q29. Do you agree with Mr. Conwell when he states "For host switches (excluding two switches serving as intermediate tandems), utilization of the T3 trunk card ranges from only four to 15 percent. This low utilization results in high trunk card investments per line in the smaller host switches"[22]? Please explain.

A29. No, I do not. Mr. Conwell's calculations do not appear to be accurate. The 3-port T3 modules assumed for the host switching sites can support up to 2,016 DS-0's. The number of DS-0 trunks included in the FLEC engineering model for the host switching (excluding intermediate tandem sites) ranges from 240 to 480. Summing the DS-0 trunks and line interfaces for these sites increases the total to 552 DS-0's and 744 DS-0's respectively. This represents a utilization of 27.4 percent to 36.9 percent for the sites.

When developing the engineering design for the FLEC models, the switching network was evaluated to determine the most efficient solution on a companywide basis. Mr. Conwell is attempting to evaluate on a per-circuit card or per-service basis. In general, this is a flawed method of evaluating the

[22] Mr. Conwell's Supplemental Direct Testimony, Page 14 Lines 8-11.

switching system. Evaluating the switching network and finding the most efficient solution on a system-wide basis is the appropriate and most equitable solution for all parties.

Q30. Please address Mr. Conwell's statement that "It is important that the RLECs demonstrate that alternative trunk cards with less capacity and lower costs are not available."[23]."

A30. The FLEC engineering model for the switching network architecture included a distributed softswitch model. Many engineering parameters were evaluated in selecting this architecture. As stated previously, the switching network was evaluated on a companywide basis and not a component level basis. Ultimately, the distributed model called for MG3510 chassis to be utilized at "host" switching locations and MG2510 chassis to be used at "non-host" locations. The trunk cards used at the respective sites are the lowest port density and lowest cost cards available for that particular system. This design represents the most efficient architecture that was evaluated, while providing an adequate GoS.

Q31. In his testimony, Mr. Conwell states "The CALEA and Centrex license fees should not be included in termination, since these costs are not attributable to terminating mobile-to-land traffic"[24]. Why were these investments included in the switching network cost estimates?

A31. The CALEA and Centrex licenses are standard components that are included in virtually every softswitch that has been implemented by Vantage Point.

[23] Mr. Conwell's Supplemental Direct Testimony, Page 15 Lines 7-9.

[24] Mr. Conwell's Supplemental Direct Testimony, Page 10 Lines 3-5.

Specifically, the CALEA feature is required by law to be implemented in voice switching systems. Many of our clients deploy Centrex services and the mobile-to-land traffic could terminate to one of these lines. Therefore, both CALEA and Centrex are included as part of the total cost of the switching system.

Q32. Can you please address Mr. Conwell's statement that "the Commission should assure that Beresford, and any other RLECs with similar SDN connections, are not basing transport electronics costs on embedded plant in service"[25]?

A32. Several of the RTC's, including Beresford, McCook, Santel, and West River, have equipment that is part of the SDN Communications network. This equipment is utilized to provide transport of traffic to the access tandem provider. The SDN Communications network is a very large and complicated network. Due to the manner in which it is architected, the equipment configuration at a site can impact the required equipment configuration for all other sites on the network. Therefore, it is not possible to develop a forward looking cost estimate for a particular site without redesigning the entire SDN network. This would be a very difficult and overly burdensome process for each of the RTC's. The only feasible method to provide estimated costs for the equipment that is part of the SDN Communications network is to utilize the actual costs for the existing electronics.

[25] Mr. Conwell's Supplemental Direct Testimony, Page 19 Lines 9-11.

Q33. Please address Mr. Conwell's statement in regards to the *line* portion of transport electronics investment in each exchange that consist of two OC-192 optical interface cards when he states, "The RLECs must demonstrate that these large OC-192 rings are justified based on total demand; otherwise, smaller bandwidth rings with lower cost optical interface cards should be reflected in transport costs and rates"[26]? Please explain.

A33. The FLEC engineering model was designed to accommodate the current and future demand for the inter-exchange transport network. Typically, fiber optic transport networks are designed for a 7 to 10 year life. In order for the system to be useful for this period of time, it is necessary to design the network to meet future bandwidth requirements. While it is difficult to predict future demand, it is important to note past and current trends. From 2001 through 2004, a majority of the SONET transport networks in which I was involved in the design and implementation were OC-48 networks. These systems typically were being deployed to replace asynchronous or OC-12 systems that were out of capacity. Since 2005, approximately 95 percent of the deployments conducted by Vantage Point have been OC-192 (or 10 Gbps) networks. These OC-192 system have been implemented to replace OC-12 or OC-48 systems that no longer have sufficient capacity. In fact, some systems that were deployed in the 2001/2002 timeframe are presently being overlayed with 10 Gbps transport. Companies that have deployed 10 Gbps transport networks, or are in the process of deploying 10 Gbps networks, include Alliance, Santel, and West River.

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[26] Mr. Conwell's Supplemental Direct Testimony, Page 20 Lines 4-7.

If OC-12 or OC-48 systems were deployed today, it is highly likely that the capacity of the systems will be exhausted well within the 7 to 10 year life of the equipment. When this happens, the transport network will need to be replaced or augmented with additional capacity. Replacing or augmenting the network will increase the total investment required for the network. Therefore, OC-12 and OC-48 networks are view to be inefficient for forward looking designs.

Q34. Please address Mr. Conwell's statement in regards to 10/100 Base T and Gigabit Ethernet data interface cards and that the *tributary* portion of transport electronics investment includes additional investment amounts for data interface cards when he states, "The RLECs must demonstrate that these investments are necessary for or attributable to the transport of Alltel's mobile-to-land traffic in compliance with FCC rule §51.505(b)"[27]?

A34. The purpose of the 10/100 BaseT and the Gigabit Ethernet data interface cards for the transport portion of the network is to provide Ethernet connectivity between the respective locations. As shown in my direct testimony in Exhibit NW-D-2, it is necessary to have connectivity between the centralized Call Agents and the Media Gateways for the purpose of call control. This connectivity is provided via the use of Ethernet interfaces. Without the Ethernet connectivity, the proposed switching system would not be able to terminate calls from outside the exchange, including mobile-to-land traffic.

[27] Mr. Conwell's Supplemental Direct Testimony, Page 21 Lines 1-3.

Q35. Mr. Conwell states that "The RLECs still have not proven that the selected components represent the lowest cost, most efficient configuration; and, they have not proven that component quantities have been efficiently sized based on projected total demand, including the RLECs' own traffic and transit traffic."[28] Do you agree with Mr. Conwell's statement? Please explain.

A35. No. Sufficient information has been provided to show that the proposed network for the FLEC engineering model was developed using sound engineering practices and efficient architectures. In addition, the RTC's have provided a detailed equipment list that provides a description of each component, a quantity of each component, and a per-unit investment total for the base cost, line cost, and tributary cost of the Inter-exchange Transport Electronics. This level of information provides more than adequate detail to enable Alltel to test the design.

Q36. Do you agree with Mr. Conwell when he indicates that for West River, "portions of the investments at Regen Hut, Reva, and the Bison/SDN nodes likely should be removed from transport and termination costs"[29]? Please explain.

A36. No. The Regen Hut is a transport electronics terminal that is necessary in order to complete the diverse fiber optic transport ring for West River. Due to the substantial fiber distances between Camp Crook and Nisland, the fiber optic transport signal must be regenerated. In addition, the Reva transport electronics is part of the overall transport network for West River. This equipment serves a

[28] Mr. Conwell's Supplemental Direct Testimony, Page 21 Lines 10-14.

[29] Mr. Conwell's Direct Testimony, Page 55 Lines 3-5.

remote office in the Sorum exchange, and West River currently has transport electronics in this location that was implemented along with their OC-192 SONET transport network. The Bison/SDN terminal provides transport connectivity to the SDN network, and it is considered an integral part of the overall fiber optic transport network for West River.

Q37. Do you agree with Mr. Conwell when he states "The capacity and investment in transport electronics equipment are determined not just by the quantity of circuits, but also their bandwidth"[30]? Please explain.

A37. No. The investment for transport electronics is related to the type(s) of tributary circuit interface cards (e.g. DS-1, DS-3, OC-3, etc.) equipped on the system, but there is not a linear relationship between the cost of a circuit interface card and the bandwidth supported on a specific interface card. For example, a 4-port OC-12 card has an equivalent bandwidth to a 1-port OC-48 card, but the pricing for these two interface cards is different. Typically, the cost per unit of bandwidth (in Mbps) is far greater for DS-1 circuit interface cards than for OC-12 circuit interface cards. In addition, the DS-1 circuit interface cards consume more slots in the SONET transport terminal per unit of bandwidth than other interface types such as an OC-12.

[30] Mr. Conwell's Direct Testimony, Page 57 Lines 11-12.

Q38. Do you agree with Mr. Conwell in comparison to a voice trunk (DS-0) when he states, "A DS-1 special circuit on the same interface card has a unit investment 24 times greater, or $195"[31]? Please explain.

A38. No. Mr. Conwell makes an invalid assumption when he performs the calculation. In order to assume that a DS-1 special circuit has a unit investment 24 times greater than a DS-0 circuit, one must assume that a 100 percent fill has been achieved on the circuit interface cards. In other words, the 28 port DS-1 interface cards must be fully populated with 28 DS-1 circuits. In addition, any DS-1 circuits would have to be 100 percent filled with 24 DS-0 circuits in order to make his assumption correct. Especially for rural telecommunications service providers such as the RTC's for whom this study was conducted, it is extremely rare for the quantity of DS-0 special circuits being provided by a company to be in multiples of 24.

Q39. Do you agree with Mr. Conwell when he states "consideration should be given to basing transport costs on a smaller system, such as an OC-48 or OC-12 transport system"[32]? Please explain.

A39. Absolutely not. This is intended to be a forward looking engineering model for the proposed networks. It is my experience that OC-12 rings are not deployed today for new core transport rings. In addition, it is extremely rare that OC-48 rings are currently being placed in service. The typical OC-48 network elements that are being installed today are for additions to existing networks. I have been

[31] Mr. Conwell's Supplemental Direct Testimony, Page 24 Lines 3-4.

[32] Mr. Conwell's Direct Testimony, Page 67 Lines 4-5.

involved in the engineering of many optical transport networks consisting of hundreds of nodes that are presently in service. Since 2002, approximately 60 percent of the network elements that have been, or are in the process of being, placed into service for Vantage Point projects have been 10 Gbps transport implementations (e.g. OC-192 or 10 Gigabit Ethernet). Furthermore, approximately 95 percent of the network elements that Vantage Point has deployed, or is in the process of deploying, for our clients since 2006 have been 10 Gbps transport systems. Many of our clients who deployed OC-48 networks in the 2002 to 2003 timeframe are finding that they no longer have sufficient transport capacity. Therefore, they are presently planning the replacement or augmentation of these OC-48 SONET networks with 10 Gbps transport systems. We typically design the fiber optic transport networks to be in service for approximately 7 to 10 years. If many companies are finding OC-48 networks insufficient today, then one can only conclude that the use of an OC-12 or OC-48 network for the FLEC models is not forward looking.

Q40. Mr. Conwell states that "The cable mileages used in the cost study for five companies are significantly longer than current interoffice mileages."[33] Please explain the reason for this.

A40. The design methodology for the RTC FLEC engineering model was developed to comply with South Dakota Codified Law, Chapter 49-31-60, by enabling switched survivable transport rings. In order to comply with this requirement, the design incorporated the use of diversely routed fiber optic cables in order to

[33] Mr. Conwell's Direct Testimony, Page 75 Lines 11-12.

provide the necessary resiliency. An exhibit depicting the fiber optic cable routing for Alliance, Kennebec, McCook, Santel, and West River can be found in Exhibit NW-R-1 through Exhibit NW-R-5. As shown in these respective exhibits, the shortest and most probable routing was assumed.

With regards to the reason for the differences between the cable mileages in the cost study and the current interoffice mileages, there are several factors that may contribute to this variation. First, it is possible that some of these companies have not completed their long-term plan for fiber optic transport upgrades to allow their network to have fully diverse fiber routing. For these segments that are not diverse, the fiber optic cable distances may be shorter than for the diversely routed cable design for the FLEC engineering model. In addition, several of these companies may have leased fibers from other service providers or deployed joint fiber rings with other companies. Within our client base, several companies have deployed joint fiber rings with neighboring service providers as a short-term solution to providing diverse fiber optic cable routes. In many cases, our clients are constructing additional routes to move away from the joint fiber rings due to various reasons. The FLEC engineering models assumed that the RTC's would construct their own diversely routed fiber optic cable network for their intra-company, inter-exchange transport needs.

A minor anomaly was discovered in the fiber optic cable distances used in the FLEC engineering design for Santel. Two numbers were inadvertently transposed for the rural fiber distance between Parkston and Tripp. The actual fiber distance is 12.5 miles, but 21.5 miles was used. This issue has been corrected, along with a slight increase in the fiber miles to Artesian since the CO is outside the town. The updated OSP investment estimates were provided to Consortia, and Mr. Eklund will describe the insignificant impacts to the FLEC model for Santel in his testimony.

Q41. Does that conclude your rebuttal testimony?

A41. Yes. However, I wish to reserve the opportunity to supplement this testimony in the future, if necessary.